



MCKENZIE WARK 2015-10-17

## THE CAPITALOCENE

ECONOFICTION, LEXICON ANTHROPOCENE, CAPITALOCENE

This civilization is already over, and everyone knows it. We're in a sort of terminal spiral of thanaticism. The paths to another form of life seem blocked, so it seems there's nothing for it but to double down and bet all the chips on the house that kills us. But there might be something to be said for an attentiveness to how all this came to pass. When the wheels stop spinning we may want to know how and why we lost it all.

Jason W. Moore's *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (Verso 2015) is an important book, in that it brings together the immense resources of world systems theory, critical geography and a certain strain of 'green' Marxism. Even though it refuses such terms, it does signal work in thinking through what the Marxist strand of historical sociology needs to be in the Anthropocene.

Moore's point of departure is the idea, close now to becoming a fact, that nature won't yield free gifts any more. It's the end of an era. It's the end of what sustained capital accumulation hitherto. Capital not only exploits labor, it appropriates nature, and it has probably run out of nature it can get on the cheap.

For Moore there's a certain change of theoretical orientation that has to happen in order to think this. Here I'm generally in agreement with him about how *not* to think about all this, even if I would want to go in a somewhat different direction for the conceptual architecture one might use to think differently.

But its not very helpful at this stage to insist that everyone agree on first principles – which as Deleuze once famously noted are never as interesting as second or third principles anyway. If there's a power to Moore's book it is in moving forward with how the dialectical tradition might think about this era of the thanatic.

What not to do is what Moore rather loosely calls the "Cartesian narrative." (5) On this view, the social emerges out of nature and disrupts it from without. Nature becomes an external thing upon which the social acts. This worldview, says Moore, is fundamental to the violence of capitalism. The Cartesian worldview gives substances an ontological status, not relations. It likes its substances to be clear and discrete, leading to an either/or logic. Nature becomes a series of objects that can be instrumentally manipulated.

Moore: "The choice is between a Cartesian paradigm that locates capitalism outside of nature, acting upon it, and a way of seeing capitalism as project and process within the web of life." (30) But there might be more than one way to do that, and more than a bit of ambiguity about what it might mean to say 'process' or 'web' or 'life.'

Some strands of 'green' thinking are on Moore's account still caught up in the Cartesian. I argued something similar in *Molecular Red*, where there I called this the 'ecological view,' in which nature was and ought to be a homeostatic cycle, one which 'man' has disturbed from without, and from which 'man' must withdraw 'his' negative effects to enable harmony to be restored. Moore wants to retrieve the word ecological, to make it mean something a bit different, as we shall see, but his 'Cartesian' has some similarities to this.

There is even a strain of green thought the Moore wants to move away from, one which sees nature as exogenous, and concentrates on the way human social organization uses (and abuses) it as a tap for raw materials and as a sink for waste products. Some real problems are thereby identified, but still within this Cartesian or rather dualistic worldview in which the natural and the human are separate things.

Moore's alternative perspective is a dialectical one. He starts by thinking humanity in nature to thinking capitalism in nature. He then wants to think this as a "double internality." (1) Capital moves through nature; nature moves through capital. This is part of a larger dialectical worldview in which "species make environments, and environments make species." (7)

I can agree that this is progress over the 'Cartesian' view, but I think there are also limits to this kind of dialectical *chiasmus*, in the way it makes the two sides appear symmetrical. It's a kind of metaphoric doubling, which unlike the 'Cartesian' one stresses the interaction, rather than the estrangement, of the two terms. But we still have two terms, and nature never quite appears as an active agent.

Moore is aware of another approach, but it gets little attention. It would be that which abandons the metaphoric doubling common to the 'Cartesian' and dialectical worldviews, and thinks along the other axis of language, the *metonymic* one of parts and wholes. The human – or a more historically specific reformulation of it – appears then as a part of nature rather than its estranged or dialectical double. This worldview can be found in different guises as Moore acknowledges, in "Haraway's cyborgs, Actor Network Theory's hybrids" (23)

When it comes to classifying worldviews, Moore collapses two distinctions into one here: there's the metaphoric / metonymic axis, and a separate substance / relations axis. What he calls the 'Cartesian' is metaphoric and substantive, whereas he dialectical worldview is metaphoric and relational, but that leaves two other quadrants, of which the metonymic and relational seems to me a viable and useful space in which to think the Anthropocene.

The virtue of the metonymic path is that it does not depend on a master metaphor and hence is a place from which one can put the very act of conceptual doubling, with its play of mimesis and difference, under scrutiny – a practice of which Haraway, for example, is well known.

The governing metaphor in Moore is what he calls the *oikeios*, a relation of life-making. It's a view of the human unified with nature, of human history as co-produced. It comes from "oikeios topos" (35) or favorable place, the relationship between a plant species and where it is found.

Moore proposes thinking capitalist civilization (such as it is) as not just a series of spatial regimes, as it is for example in Giovanni Arrighi and David Harvey, but also of 'natural' ones. On this view, capital produces not just spaces but natures. This will then be more than a story about after-the-fact 'environmental' consequences of capital. "Instead of asking what capitalism does to nature, we may begin to ask how nature works for capitalism." (12)

In the *oikeios*, humanity is unified with nature in a flow of flows, and on occasion Moore comes close to understanding this metonymically. *Oikeios* is a 'matrix' (a curiously gendered metaphor). But the focus always ends up shifting to the question of how capitalism produces natures. Capital makes nature work harder, faster, and cheaper – indeed preferably for free. In another version of *chiasmus*, Moore conceives it firstly as capital internalizing planetary webs of life; secondly as the biosphere internalizing capitalism.

But note here that the 'Cartesian' dualism is alive and well. It has just shifted from one of substances to one of relations, thus shifting the stress from the alienation of man from nature to the action of producing nature in a human image – in this case in the historical form of capital. Moore: "... the capital relation transforms the work/energy of all natures into frankly weird crystallizations of wealth and power: value." (14)

Moore attempts to leave behind the metaphysical worldview of man and nature as metaphoric double of difference and identity, agency and interaction. He does so by making this metaphor historically specific: the relation between the two sides is the law of value specific to capitalism. Thus an historically specific relation between man and nature becomes the centerpiece of thought, but it does so within a worldview still shaped by decisions among metaphysical categories.

As we shall see, this construct of his actually works and gets results. But I think one has to put it alongside some other constructs that might get other results. Here I'm thinking of that school of 'green Marxism', of John Bellamy Foster and others, that is less

interested in the law of value and more interested in Marx's attempts to use the concept of *metabolism*.

Moore and I agree that "Foster's enduring contribution... was to suggest how we might read Marx to join capital, class and metabolism as an organic whole." (84) But like Amy Wendling, I don't think Marx attempts to deploy metabolism as a metaphor. I think he means that there is an actual, planetary metabolism. In Bogdanovite terms he has taken a diagram from one field of scientific inquiry and speculatively deployed it in another, in anticipation of its verification.

And as it turns out, he was right. We can now say that earth science confirms this speculative insight. The Marx who was progressively abandoning Hegelian metaphysics for the scientific materialism of his time was onto something. The earth is indeed a heat engine. That this can be measured, that we know that average temperatures are rising because of rising concentrations of atmospheric carbon, is one of the key scientific results that opens toward the problematic of the Anthropocene.

Moore: "Metabolism is a seductive metaphor... Metabolism as 'rift' becomes a metaphor of separation, premised on material flows between Nature and Society." (76) I agree that there are residues of that in the worldview of the green Marxists. But I am not prepared to abandon them because I think it is vitally important to follow up on their opening within Marxist thought of the neglected legacy of Engels and the question of how to engage with the natural sciences. The truly vital information about the current situation is coming from the earth sciences, and I find it less than helpful to keep claiming some superior 'dialectical' form of knowledge over and above the methods of the natural sciences.

In *Molecular Red*, I offer a different way of thinking metabolism, and what Foster calls after Marx metabolic rift. It isn't a rift between nature and society at all. It's a rift in the cycle of some element or compound. In the example Marx took from von Leibig, it's that phosphorous and nitrogen are extracted from the soil by crops growing in the countryside, which feeds an urban population of workers, who piss and shit those elements down the drain and out to sea.

Or, to give a contemporary example, carbon. Carbon compounds extracted from underground are used as fuels, venting carbon dioxide into the atmosphere. The metabolism is the planetary processing of elements and compounds; the rift is the widening gyre that changes the distribution of planetary chemistry, and the effects that such rifts cause. In the first example, it was a decline in yields, resolved by adding artificial fertilizers. In the second example, its rising average temperatures, so far not solved at all.

It is possible to think this both metonymically and historically. In both these instances of metabolic rift, historical human action is a part of a planetary web of relations. In both cases, forms of commodity economy or capitalism are indeed implicated. But it is possible to think of planetary metabolic rifts that had no human agents at all. For example, the role of bacteria in changing the composition of the atmosphere that increased the proportion of oxygen and which made terrestrial life possible, or the evolution of plant life containing lignin which led to the vast fossilized reserves of coal in the first place. In this perspective, the historical act of metabolic rift, caused by capitalist relations of production, joins a much longer story, on a different time scale. One can think in geological and historical terms together. The historical is a little part of the geological.

Moore: "metabolism arguments have avoided the active role of cultural processes and scientific knowledge in the history of capitalism. They have consequently facilitated a kind of materialism that dramatically understates the roles of ideas in historical change." (79) Well, yes. Metabolism is a particularly vulgar-Marxist concept. But as I have argued elsewhere, the Anthropocene is a very vulgar affair. It might require the humanities-trained to get out of our comfort zone.

The Anthropocene is a call to think the materiality of production and reproduction processes, and to think the relation between social and scientific knowledge without the presumption that the former always trumps the latter. Its time, as Bogdanov might put it, for a comradely rather than a hierarchical approach to collaborative knowledge. This means giving up the will-to-power of humanities thought, which sees the sciences as dominant and tries to claim an even higher form of 'spiritual' domination over the sciences in turn in the name of the qualitative.

Moore: "The metabolism argument has painted a picture of capitalism sending Nature into the abyss." (80) Well, both the models and the data point that way. The planet turns out to be a complex system. Even a mere passing part of it, capitalist civilization, has the capacity to rapidly open a metabolic rift with the capacity to undermine the conditions of possibility for our species-being. The tarrying with radical otherness required to think this, outside the 'socially constructed' interiors of culture, tends to disappear in Moore.

So unlike Moore, I want to stick to what he calls the "metabolic fetish." (15) Because actually it's the opposite. It is if anything a kind of 'psychotic' worldview, in which the boundaries of human specialness dissolve. If anything, I think the fetish is Moore's desire to stick always and only to capitalism's law of value. It's the part that stands in for the whole of metabolism, but presents itself instead as a double. Moore's double internality calls capital into being as an identity. Capital internalizes the relations of the biosphere; the biosphere internalizes the relations of capital. These become symmetrical relations.

The thing about the sciences is that while on one end of them is a mass of petty human interests, they mediate to the human, via an *inhuman* apparatus, knowledge of a *nonhuman* world that is far from petty. The sciences cannot help but bear traces of a radical otherness, even when the human discourse that results is saturated in metaphors drawn from mere human and historical

social formations.

I think Moore's view of the sciences is too much a species of what Quentin Meillassoux calls *correlationism*, in which there is only knowledge of an object when there is a corresponding subject, in all its historical specificity. In *Molecular Red* I propose a quite different solution to this than Meillassoux, but like him I want to retain a sense of the way the sciences open a window looking out from the cloistered world of humanities discourse.

I don't think Marx meant his work to be mere humanistic knowledge. Moore: "The dialectical thrust of Marx's philosophy is to see humanity/nature as a flow of flows: as humans internalizing the whole of nature, and the whole of nature internalizing humanity's mosaic of difference and coherence." This is to retard the direction of Marx's thought, to take it backwards to its enabling conditions in Hegel, rather than move it forward toward his encounter with scientific materialism, and that production of a knowledge of the nonhuman via the inhuman of the apparatus. One result of which is the metonymic worldview, in which the human in merely historical, and a very tiny part of an historical universe, whose constants are not metaphysical but physical.

The problem of metabolism connects human history to planetary physics. But while humanists might rightly claim that earth scientists have little to say about the internal complexities of that history, one has to pay attention also the reverse claim, which finds not place in Moore: that we're not taking the sciences seriously enough. Moore: "The evidence amassed by the scholars working in the Anthropocene and cognate perspectives is indispensable." (25) But note its only the evidence. The sciences are stripped of the power of concept formation.

Of course as Haraway reminds us, fetishism need not be a bad thing. It can be enabling. Moore's worldview is indeed enabling. He is able to tell a story of capitalism that stretches back further in time than the industrial revolution, and account for a sequence of moments in which it not only exploited land and labor, but also appropriate forms of unpaid labor and energy into itself. Its continual expansions of wage labor always required resources from without.

What capital appropriates is the Four Cheaps: labor-power, food, energy, and raw materials. (I think there's a Fifth Cheap, cheap information, but we'll come to that). The history of capitalism is one of successive *historical natures*. Revolutions in ideas about nature are closely tied to waves of primitive accumulation. "Crucially, science, power, and culture operate within value's gravitational field, and are co-constitutive of it." (54)

Here I think it helpful to remember that while the basic metaphors of the sciences come from the social organization of the time, and the objectives of much of the production of knowledge is military or acquisitive, the results of scientific inquiry often point far beyond those metaphors and intentions. Climate science itself is a key example here. It might have got its funding for military or agricultural objectives, but it ended up finding things that point to the need to radically transform the whole mode of production.

As Moore rightly reminds us, there's emerging work on the role that minor climate variations may have played even in historical times. The eclipse of the Roman empire corresponds to the end of what is even called the Roman Climactic Optimum (circa 300AD). The feudal system gets going around the time of the Medieval Warm Period (800AD) and starts to break down around the time of the Little Ice Age (1300AD).

There's a quite justified nervousness about Malthusian thinking, however. Limits have to be thought as internal contradictions within forms of social organization, not just as externally given constraints. Moore's point here is well taken, but it might call for a slightly more subtle approach. Maybe its about perception internal to a social organization of a constraint that is external, and hence has contours that can be mapped and measured with the tools of a physical or natural science. But where the specific form the limit takes is both historical and natural *at the same time*.

It's a limit for a form of social organization, and yet real all the same. For instance, population pressure on agriculture will reach a threshold, but only for a give historical organization of agriculture with given yields. There are still surely limits to how far yields can be increased, and hence to the population a given area under cultivation could support. That limit can only be exceeded with methods that actually exist.

In practice, solutions to problems of limits have tended to seek solutions through plugging in new resources from without. Capital keeps on accumulating and transforming commodity production, but it also keeps looking for ways to make cheap nature, low cost food, raw materials, energy to which one might add the recent discovery of cheap information. Moore resists the suggestion to add Cheap Money to his list of cheaps: "Cheap Money serves to re/produce Cheap Nature; it is not Cheap Nature as such." (53) But I would rather see money as a form of information, and information in turn as a metonymic part of nature rather than something external.

An oddity of Cheap Nature is that it can work by reducing value composition even while increasing the technical composition of capital as a whole. It often takes a lot of capital to tap a resource: a mine, for example, often requires a vast amount of machinery. But if it opens a flow of a cheap resource it reduces the value composition of capital as a whole, at least temporarily.

Value incorporates a lot besides labor. Capital exploits wage labor, but everything else is appropriated. "Value does not work unless most *work* is not valued." (54) There's a non-identity between the value-form and the wider field of value relations. The law of value establishes what has been struggled over since the 16<sup>th</sup> century. Value falsely breaks nature up into interchangeable parts, as Paul Burkett would also say.

In Moore's historical overview, there's two eras of capital, one based on land productivity and a second on labor productivity. (In *A Hacker Manifesto*, I put it instead as three eras of commodity production, based on successive degrees of abstraction, first of land, then labor, then information. I called only the middle one 'capitalism', Moore calls the first and second together capitalism and describes the third with the more conventional term neoliberal capitalism.)

Throughout its historical trajectory, capital is in a disequilibrium in relation to value's capitalization and appropriation from nature. (Moore does not put it this way, but to me this is capital as driver of metabolic rifts). For example, in the 16<sup>th</sup> century moment of capital's globalization, it drew in silver from mines in Saxony and Potosi, sugar from Barbados and Brazil, timber from Scandinavia, in each case substituting nature for machinery and lowering the value composition of capital.

Marx had grasped something of this under the rubric of capital's annihilation of space by time. Capital runs on an abstract time, linear and flat, operating on a nature external to it. Abstract time abstracts space, rendering space comparable, equivalent and exchangeable. But what's really at stake here is a kind of frontier-making, for the appropriation of unpaid work and energy, and the subordination to capitalist time of other temporalities, such as seasonal time. Capital appropriates nature to itself, including the unpaid work of women and slaves, which from the point of view of capital are not human capacities, but just other parts of nature.

As Moore sums this process up: "The law of value, far from reducible to abstract social labor, finds its necessary conditions of self-expansion through the creation and subsequent appropriation of Cheap Natures.... Thus the trinity: abstract social labor, abstract social nature, primitive accumulation. This is the relational core of capitalist world-praxis. And the work of this holy trinity? Produce Cheap Natures. Extend zones of appropriation. In sum, deliver labor, food, energy, and raw materials – the Four Cheaps – faster than the accumulating mass of surplus capital derived from the exploitation of labor-power. Why? Because the rate of exploitation of labor-power.. tends to exhaust the life-making capacities that enter into the immediate production of value." (67)

For example, British capitalism at its peak depending on grain and sugar from the Americas, and many other 'free gifts' from what it thought of as nature, from the reproduction of families, soils, even the biosphere itself, which even in this period capital was tending to exhaust. Marx saw exploitation as happening in both human and extra-human natures, in the exploitation of the soil, for example. It is not just fossil fuels that capital adds as a cheap prop to value. What for Moore is an early phase of capitalism prior to the industrial revolution was already drawing on worldwide uncommodified natures.

The problem of crisis happens between zones of commodification and zones of reproduction. Moore does not want to call the latter a problem of scarcity. "Marx did not like to write about scarcity. Malthus ruined the question for him." (92) Here I think a reading of Sartre could have much to offer. Unlike Malthus, Sartre makes scarcity an historical category rather than a natural one, and thus also makes competition and violence historical. Violence in Sartre does not stem from 'human nature' but from scarcity as historically produced. But that's a topic I have broached elsewhere.

Instead, Moore picks up on Marx's little known interest in under-production. If the rate of profit is inverse to value of raw materials, then raw material constraints depresses profits and chokes off accumulation. Hence modernity is so often about the question of what can be appropriated *without* being commodified. Its about non-commodity zones of reserves or where reproduction takes place by itself, outside the commodity system. The interesting paradox is that to avoid under-production capital needs *non*-commodify gifts. Here one might say a bit more about the fifth cheap – information – and the need for cheap information about the where and how of those other components of Cheap Nature that capital needs to appropriate in order to continue to exploit labor and accumulate.

There's a role then for what Moore calls the world-ecological surplus. He sketches an interesting view of the crisis of capital as related to the energy returned on capital invested. Expansions of labor productivity required expansions of ecological surplus appropriated from frontier territories. Moore also gestures to this being an entropy problem, but he does not linger over the possibilities of working jointly on how this might be modeled with approaches from the earth sciences. One could indeed think commodification as an ordering that can only happen in an open system, where its order appears at the turbulent site where flows meet, but where waste heat and disorder always has to be expelled somewhere. One could then think commodification's problem as running out of open space within its own circuits.

In Moore's language this problem appears thus: "it is not just the reproduction of labor-power that has become capitalized; it is also the reproduction of extra-human natures. Flows of nutrients, flows of humans, and flows of capital make a historical totality, in which each flow implies the other." (99) Only maybe that totality is not quite historical in the way history as a humanities discipline, or Marxism as re-read as only a humanistic mode of thought, might think 'history'.

It is interesting that it is at this point that Moore gets caught up in the dualisms he earlier tried to forswear: "For in capitalism, the crucial divide is not between Humanity and Nature – it is between capitalization and the web of life." (100) What's missing here is the earth system perspective, which isn't about a metaphoric couplet at all, regardless of what one makes the two terms. It's a worldview that is at base chemical. One need not think a dialectic of capital and life; one can think instead of an earth system as a chemical-metabolic process of which both life and capital are now components, each operating on its own very different temporalities.

Still, I have to acknowledge that while I think these things through a different worldview, Moore's worldview nevertheless yields powerful insights. In his dialectical view, capital's externalization of costs is at the same time also an internalization of space. That's a good way to make sense of what happened to the atmosphere. It's a formerly external space internalized within capital itself. What we're not looking at closely then however is the physics of why that's a bad idea.

"The history of capitalism is the history of revolutionizing nature." (112) Even before things came to this impasse, capital has had a never-ending struggle on its hands. "Over time, the Four Cheaps cease being Cheap." (103) Capital tries over and over to create nature in its own image, quantifiable and interchangeable. Maize is a great example, being no longer just a food but an input into everything, from fuel to plastics. But at some point one has to think not so much the problem of peak oil (or the lesser known problem of peak phosphorous). One has to think *peak appropriation*.

This I think is one of Moore's really strong insights. This is not a peak in output, but a peak in the gap between capital set in motion to make a commodity and the work and energy embodied in that commodity. For any given forces of production, cheap nature comes to an end. Capital recognizes scarcity only through price, and price does not really cover the long run. The biosphere is finite; capital is not. Nature is "maxed out" rather than wiped out. (113)

Over time, the value of inputs starts to rise, the rate of accumulation slows, and capital has to find new ways to reconfigure the oikoeis and restore cheap inputs "The rise and fall of the ecological surplus therefore shapes the cyclical and cumulative development of capitalism." (118)

Moore develops a periodization based on that of Arrighi, but significantly extending it, as Arrighi's relentlessly sociological perspective tends to leave out the role of cheap nature. The periodization is as follows: the German-Iberian cycle (1451-1648), Dutch cycle (1560s-1740s), British cycle (1680s-1910s), an American cycle (1870s-1980s). Then there's a neoliberal one, which we might all still be in.

In this view, capitalism starts with the central European mining boom of 1450s, and moves through a series commodity frontiers and busts. In each case, exhaustion is relational rather than substantial. "Exhaustion occurs when particular natures – crystallized in specific re/production complexes – can no longer deliver more and more work/energy." (124)

There are two kinds of crisis, epochal and developmental. An epochal crisis gave rise to capitalism out of feudalism. Note that it may have corresponded also to a climate variation. The crisis of feudalism is thus a complex of class, climate and demography. Limits are always historically specific in Moore, but we should note that they are all the same real limits. They only become relative in relation to a succeeding technological-social complex that renders them such. Nothing guarantees that there is always another historical form on the horizon.

Getting away from the limited historical view in which capitalism equals the industrial revolution and the exploitation of fossil fuels is one of Moore's objectives, and in this he succeeds admirably. The form of commodity production that preceded the industrial revolution was already one that appropriated tract after tract of cheap nature. Hence it is not merely fossil-capitalism that's the problem.

All the same, Moore does acknowledge the peculiar qualities of the British cycle. "For the first time in human history, planetary life came to be governed by a single logic of wealth, power and nature: the law of value." (137) Here under-production was solved through the input of vast amounts of cheap natures, for the first time on a truly planetary basis. However, both under-production in the form of crop failures and the more classic over-production crises were involved in the problems of 1848. This "dialectic of productivity and plunder" (137) was the beginning of a global hegemony of the value relation, and an experience of peak appropriation on a planetary scale.

When the rising organic composition of capital puts pressure on rate of profit, how does profitability revive? Most Marxist narratives are about crises resolved through creative destruction. But the other way is fresh inputs of cheap nature. Or rather, inputs of a first nature into second nature, where the former is primary produce extraction and the latter is technical and social organization. (Of course I would wonder here about the role of what I call third nature, the sphere of 'cheap' information).

Moore: "This dialectic of appropriation and capitalization turns our usual thinking about capitalism's long waves inside out. The great problem of capitalism, in effect, has not been too little capitalization, but too much. Its greatest strength has not been its move towards capitalization 'all the way down' to the genome, but rather appropriation all the way down, across and through. The socio-technical innovations associated with capitalism's long history of industrial and agricultural revolutions were successful because they dramatically expanded the opportunities for the appropriation of unpaid work/energy, especially the accumulated work/energy of fossil fuels (over millions of years), soil fertility (over millennia), and humans 'fresh off the farms' of peasant societies." (152)

As Moore rightly points out, if technical dynamism were the only driver of successful centers of accumulation, then the Germans would have beat both the Brits and the Americans. The vastly greater access to cheap natures was a powerful force in both the British and American, cycles of accumulation.

The concept Moore offers for thinking this is the *world-ecological regime*. Moore: "capitalism does not *have* an ecological regime;

it is an ecological regime." (158) This is a version of David Harvey's spatial fix theory from *Limits to Capital*, combined with Arrighi on how Dutch, British and American capitalist formations are organizational revolutions of territorial power (and one might add, information). "Each long wave of accumulation was made possible by organizational revolutions that gave the new hegemonic power 'unprecedented command over the world's human and natural resources.'" (160)

Each world-ecological regime is undermined not just by anti-systemic movements and competition from rivals, but rather these have to be seen as always and already social-ecological contests. Thus Arrighi was dealing only in partial totalities. Moore mentions in passing Harvey's point that financial expansion was often connected to accumulation by dispossession, which in Moore's terms is the appropriation of cheap natures. Here cheap information appears once again as a category that could do with some more thought. Capital has to know something about what it is going to dispossess.

The strength of Moore's perspective is to think the *oikieos* as historically specific dialectical relations of social forms and natural terrains, each internalizing the other. Then to think a more specific series of historical formations, the world-ecological regimes, through which the commodity form sustains and expands itself through the appropriation of cheap natures. This produces both under-production constraints specific to the exhaustion of particular resources and moments of peak appropriation, as well as the more familiar over-production crises in which capital accumulation fails as the value composition of capital rises. Moore is particularly interesting on the complex role of cheap nature in attempts to lower the value composition of capital.

Any particular worldview comes with certain affordances. In Moore, I think it's the way capital functions, as in Lukacs, as the bad totality, a failed metaphorical doubling of the world. But if it is to be a totality, Moore has to insist that there's only the historically determined viewpoint from within. Strangely, despite a passing reference to anti-systemic movements, the point of view of Moore's thinking is always that of capital itself. We do not proceed here from the labor point of view. Certainly the labor of producing verifiable knowledge about the nonhuman world gets very short-shrift. Certain data from the earth sciences enters – has to enter – any social thought today, and to Moore's credit he is one of the few who clearly knows this. But for him this can only be *interpreted* from within the point of view of capital itself.

There's some limits to this approach, I think. The problematic of the Anthropocene gets strangely dismissive modifiers: it is a "fashionable concept," an "easy story." (170) Moore dismisses with strangely moralistic language the "allure of easy mathematization." (181) Surely, if one has attempted to read the most recent report of, for example, the Inter-Governmental Panel on Climate Change, or sat through even a brief explanation of what is at stake in the debate among actual geologists about whether to call this the Anthropocene, one is left with the impression that these things are far from easy or fashionable.

It makes very little difference whether one dates the Anthropocene to the start of the industrial revolution or the detonation of the atom bomb. From the point of view of geological time, which counts years in billions, those are the same moment. What the geologists need is an agreement on a convenient marker in the geological record. Of course, like anyone else, they probably have all sorts of assumptions about what that marker might mean, but one cannot collapse the scientific problem entirely into its background assumptions.

It is indeed the case that one can find geologists and others who want to think the Anthropocene who hold neo-Malthusian views of population, simplistic views of tech-resource drivers of change, and think the concept of scarcity abstracted from historical relations. But if one wants to talk to them about such things and persuade them of the necessity of thinking the internal complexities of merely historical time in a bit more detail, it seems to me bad tactics to refuse to recognize the validity of their own fields of knowledge or to refuse to speak to them in their own language.

Here Moore rightly hews against a certain limitation in Anthropocene discourse, but in the process overshoots the mark: "to locate the origins of the modern world with the steam engine and the coal pits is to prioritize shutting down the steam engines and the coal pits.... Shut down a coal plant, and you can slow global warming for a day; shut down the relations that made the coal plant, and you can stop it for good." (172) The first point is well taken. As Moore ably shows, the relation between the commodity form and its dependence on forcing gifts of cheap natures predates the fossil fuel era.

But it just isn't the case that shutting down capitalist relations of production and extraction ends the problem of the Anthropocene. Merely negating capital does not solve the problem of feeding, housing and clothing seven billion people without destroying their conditions of existence. This is the great fallacy of seeing everything from the point of view of capital, even if that point of view sees capital itself in the negative. This for me is the big problem with the desire of certain Marxists to talk about the 'Capitalocene' instead.

It may well be that "How we conceptualize the origins of a crisis has everything to do with how we choose to respond to that crisis." (173) But it does not in itself set the parameters within which the crisis of the Anthropocene can be managed. It is true enough that most Anthropocene discourse tends to black-box the problem of social forms and histories. But I don't think it's a good solution to respond by black-boxing geological time frames and the metabolism known to earth sciences.

"Whereas the Anthropocene argument begins with biospheric consequences and moves towards social history, an unconventional ordering of crises would begin with the dialectic between (and among) humans and the rest of nature, and from there move towards geological and biophysical change." (176) Sometimes it's useful to change points of view. But the insistence on one over the other mars Moore's otherwise so salutary work. The social and technical struggles of this era are going to take

almost, but not entirely, unprecedented collaborations among workers of all kinds, including knowledge workers, and including knowledge workers in scientific and technical fields. A more comradely way of relating forms of knowledge to each other has to be a priority if we are to move forward with such a project.

The question with which Moore's book ends is of whether we are experiencing the end of cheap nature, a truly epochal rather than merely developmental crisis. But it is not one he can answer with the tools of historical knowledge alone. The question is left dangling. One really needs the collaboration of the earth sciences to even think it. A dialectical history can indeed grasp a part of the problem, but only a part. And its tendency is to devalue the claims of others to other parts, including other parts of the totality. It wants to be the part that knows the whole. And it wants simply to be taken at its word that it knows the whole. This is not compatible with the comradely practice of working together to join each partial process of knowing to each other partial process – as Bogdanov well knew in his critiques of the pretensions of the 'dialectical materialism' of his time.

Fortunately I think what is valuable in Moore's book has little to do with its claims to first principles. Indeed, "We can begin to read modernity's world-historical patterns – soil exhaustion and deforestation, unemployment and financial crashes – through successive world historical natures." (291) And we can do so alongside ways of understanding the problems of the Anthropocene coming from other disciplines.

Moore has correctly perceived a need to steer away from a certain environmental determinism, but I think he has produced a variant of social reductionism rather than avoid that other pitfall. To the extent that my disagreement with Moore is just a matter of emphasis and tactics, from my experience I think we could do with a little more old-fashioned marxocological vulgarity, particularly within the fields of knowledge in which we work. A blanket prejudice against the sciences is still strong there. And at a time when climate scientists receive death threats, a truly obsolete tactic.

The achievement of Moore's book is to move past a metaphysical concept of nature towards an historical one. But in the process the various scientific ways of knowing nature are not recognized as valid and at least partially autonomous. These are assumed to be merely internal to capital – while historical knowledge gets some mysterious, partial exemption from that constraint.

"Capitalism's basic problem is that capital's demand for Cheap Natures tends to rise faster than its capacity to secure them." (297) Over several cycles, it managed to wiggle out of that contradiction. Most recently, the 'green revolution' in agriculture keep yields rising, and allowed for downward pressure on rising wage demands. There's a really interesting sketch of a through world-ecological explanation of the so-called 'neoliberal' cycle here, which gets us away from those explanations, for instance by Wendy Brown, that locate the neoliberal in the world of politics and ideology. The neoliberal thrived on cheap food and fuel, although I would add that it also thrived on cheap information, both quantitative and qualitative.

Still, I just don't understand why one would claim that "It would be mystifying to say that the limits of capitalism are ultimately determined by the biosphere itself, although in an abstract sense that is true." (60) There's nothing abstract about it at all. It's the very definition of the concrete in the age of the Anthropocene.

But then I think its just an artifact of correlationism to assert that "humans know only historical natures." (115) This is clearly not the case with geology and earth systems science, which know things with scientific certainty about a time before humans even existed, and about times in which we will all be long gone. Lacking a way of thinking how such knowledge could be possible within the confines of historical time, Moore keeps pushing the problem away.

I can agree that "A view of capitalism that proceeds from nature-in-general absent the interpenetration of historical time is... extraordinarily limiting." (116) But the reverse is true also, but where the other side of the chiasmus is not nature-in-general as a metaphysical concept, but an ensemble of sciences that know nature as something nonhuman, mediated through an inhuman apparatus of techniques, and only partially contaminated in its aims and metaphors by historically determinate social relations.

Its not quite enough to claim that "Industrial capitalism gave us Darwin and the Kew Gardens; neoliberal capitalism, Gould and biotechnology firms." (117) One of the best accounts of the contamination of the life sciences by metaphors from commodity, patriarchal and imperial social relations is Donna Haraway, but she does it in part by basing her critique of those versions of biology on a knowledge of *other kinds of biology*, one small example of which would be the organicism of the great Marxist biologist Joseph Needham. This metonymic view, in which human history is a part of whole not entirely knowable as such, gives no privilege to the human as metaphorical double of nature. It does not even privilege eukaryotes.

But if there's one profoundly true remark in Moore's book, it is this: "To call for capitalism to pay its way is to call for the abolition of capitalism." (145) The great virtue of his work is to show in historical depth and detail why this is so. It has never gotten by without Cheap Nature. There is a great deal of value in his account of the world-ecological regimes through which capital has appropriated the natures that keep the exploitation of labor going. It adds a whole new dimension to what was sketched out as such in the work of David Harvey, the late Giovanni Arrighi, and let us not forget here also the late Neil Smith. Such a rich historical understanding of world-ecological regimes is going to be of vital importance.

taken from here



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